I. Background

On June 11, 2003, the Department of Housing and Community Development (Department) submitted its report to the California Building Standards Commission (CBSC) Code Change Committee. This report detailed the Department's decision-making process and presented its recommendation for the adoption of the 2003 International Building Code/International Residential Code (IBC/IRC) as the base documents for the 2004 California Building Code (CBC). The primary concern expressed by the Department was that the alternative under consideration, the 2003 NFPA 5000 Building Construction and Safety Code (NFPA 5000), did not contain the conventional prescriptive construction methods that are currently contained in the California Building Code. It is the department's determination that failure to provide these conventional prescriptive methods would have a negative impact on its regulated public in terms of ease of use and cost.

At the conclusion of the public presentation of the Department's report, Commissioner Cavanaugh asked the Department to provide a report on the steps that would be needed to use the NFPA 5000 in combination with the conventional structural standards of the IRC (hereinafter referred to as "the IRC/NFPA 5000 proposal".)

For the purpose of this analysis, the Department assumes that the conventional structural standards of the IRC are those items not covered by the other model codes (i.e. the California Plumbing, Mechanical, or Electrical Codes) and that the IRC would be subject to the State Fire Marshal's review and modifications for fire and panic safety.

This analysis examines:

1) Is it possible to use the IRC in combination with the NFPA 5000; and

2) If so, for the occupancies subject to the Department's authority[1], can it be done in a manner that addresses its concern about the loss of the step-by-step "cookbook" approach discussed in its June 11, 2003 report to the Code Change Committee?

[1] The Department regulates the erection, construction, enlargement, conversion, alteration, repair, occupancy and use of all hotels, motels, lodging houses, apartment houses, and dwellings as well as the buildings and structures accessory thereto.

II. The Process Used in this Evaluation

During the available time, the Department faxed letters to NFPA and ICC offering an opportunity for both organizations to provide input regarding the coordinated use of the NFPA 5000 and the IRC. Both organizations have responded and the Department has considered the responses. (Copies of the response letters are provided as Attachments A and B.) Similar letters were also forwarded to the Division of State Architect (DSA), the Office of Statewide Health Planning and Development (OSHPD) and the State Fire Marshal (SFM). In addition, the Department met with representatives of DSA and OSHPD.

Over the last several months, the Department received and reviewed a large number of technical evaluations and other documents from many stakeholders and interested parties that have bearing and relevance to this evaluation.

Finally, as part of its review, the Department contacted the City of Pasadena, Texas, the only jurisdiction to the Department's knowledge that is currently using the combination of codes. The Department contacted Mr. Lyndon Barringer, the Assistant Building Official for the City.

Pasadena, Texas uses the 2000 edition of the IRC exclusively for one and two-family residential structures (not including hotels and motels) as required by Texas state mandate. These residential structures are designed and constructed using the IRC provisions for structural, fire and panic safety, light, ventilation and other environmental design criteria. In those instances where the IRC references to the International Building Code (IBC) for structural criteria due to unique design elements the City of Pasadena permits the use of those references. The NFPA 5000 is, therefore, used exclusively for all other structures.

According to Mr. Barringer the City of Pasadena does not anticipate the use of a combination of both the NFPA 5000 and the IRC on any single structure.

III. The IRC/NFPA 5000 Proposal for One and Two-Family Homes.

Unless there are some unique design features to be incorporated, the IRC is intended to be a comprehensive, stand-alone document limited in its scope to the construction, alteration, or addition to one- and two-family dwellings, and structures accessory thereto such as garages, patio covers, and decks. As noted in the Department's June 11, 2003 report, for these types of occupancies the prescriptive conventional construction methods found in the IRC would continue the step-by-step "cookbook" type approach currently in use in California.

Under the IRC/NFPA 5000 proposal for those projects covered by the IRC the user would have available the conventional prescriptive standards to be used in conjunction with California's adopted Plumbing, Mechanical and Electrical Codes. Such an approach ensures that all appropriate structural, life-safety and

environmental design criteria are incorporated and are internally consistent. For these occupancies, and for the activities that can utilize the prescribed conventional standards contained in the IRC, the IRC/NFPA 5000 proposal would be consistent with the current availability of conventional standards in the CBC. This conclusion is consistent with those expressed in the NFPA's response for this evaluation in which they note that the "(u)se of the NFPA 5000 with the IRC could work fairly easily".[2]

However, even in one- and two-family dwellings there are individual components or unique designs that fall outside the conventional standards and require some engineered calculations (e.g., heavily loaded footings as a result of large spans). The IRC addresses these situations by references to its companion document, the International Building Code (IBC). The IBC/IRC books have been designed to be used in conjunction and are suitably cross-referenced. In some cases the IBC contains conventional prescriptive standards for occupancies outside those covered by the IRC that are available for the engineer or architect to incorporate into a particular design.[3] If engineering is necessary, the IBC contains the appropriate tables and formulas for calculations. The fact that the IRC is designed to dove-tail with the IBC leads the International Code Council to argue that intrinsic and linguistic conflicts between the NFPA 5000 and IRC preclude their use in combination.[4]

The NFPA 5000 does not contain conventional construction methods and has few of its own tables or formulas for engineering calculations. Therefore, with the IRC/NFPA 5000 proposal any design feature that is outside the IRC would have to be engineered using reference sources that are not as readily available within the text of the NFPA 5000. Additional engineering costs impact affordability and to the extent there is difficulty in locating outside references the task becomes more cumbersome. There are two possible solutions to ensure the usability of the IRC.

(a) The IBC could be retained in total as the basic cross-reference document for the IRC. This is a solution allowed by the City of Pasadena, Texas and is the most direct mechanism to address this problem. With this solution, the IRC operates as it is designed, avoids potential conflicts, and addresses the needs of

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[2] NFPA June 25, 2003 letter from Raymond B. Bizal to Richard Friedman.

[3] Conventional Construction methods include tables and prescriptive standards that provide wall, floor, header, footing details and other building component details that do not require additional calculations because they have been time tested for safe use as construction designs. The alternative to conventional construction methods would be the use of tables and formulas that require an engineer to perform various calculations for loading and stresses necessary for a safe designed wall, floor, header, footing or other building component.

[4] ICC June 25, 2003 letter from Paul Armstrong to Richard Friedman.

the regulated public. As a lesser alternative, the Department could identify and adopt by reference only those specific portions of the IBC being referenced in the IRC. This would work equally well for the regulated public, but would be more labor intensive for the Department without commensurate off-setting benefits.

(b) The Department could locate the specific IBC references and review the NFPA 5000 for the referenced documents to determine their availability and usability as regulations. If available, those sections could be cross-referenced into the IRC through California amendment. The NFPA suggests that these amendments could be done relatively easily.[5] Not surprisingly, the ICC takes the alternative point of view.[6] If there are no similar engineered calculating methods referenced by the NFPA 5000 or they are incomplete, the Department would determine what amendments could be made to ensure the NFPA 5000 reference language will be adequate to protect the public health and safety as a reference to the IRC.

Summary

Subject to the factors raised in this report, it is possible to integrate the IRC and the NFPA 5000 for one- and two-family dwellings in a manner that address the Department's chief concerns for those occupancies. The integrated work would be subject to amendments for use with the California Plumbing, Mechanical, and Electrical Codes; amendments of the SFM for fire and panic safety; and other appropriate California amendments by the Department.

IV Other Occupancies Subject to the Department's Jurisdiction

While one and two family residential projects would utilize the IRC, under the IRC/NFPA 5000 proposal all other Departmental occupancies would naturally fall within the scope of the NFPA 5000. These occupancies would include the construction of hotels, motels, lodging houses, apartment houses, condominiums, accessory structures, and many mix-occupancy applications.

Previously, in its June 11, 2003, report to the Code Change Committee, the Department reported:

> "After careful review, the Department has concluded that although the two competing codes take different paths in organization and style, with appropriate California amendments and enforcement, either model code will adequately meet the essential requirements for the protection of the public health, safety and general welfare."

[5] See NFPA June 25, 2003, letter from Raymond Bizal to Richard Friedman, page 3.

[6] See ICC June 25, 2003, letter from Paul Armstrong to Richard Friedman, page 3 and 5.

Summary

The Department sees no reason, based on current information, to alter this assessment. Therefore, although decisions need to be made as to how to efficiently and effectively address the issue of source materials to be used with the IRC, the Department concludes the IRC/NFPA 5000 proposal can be implemented.

V. What is Not Provided by the IRC/NFPA 5000 Proposal

The only occupancies covered by the IRC are one- and two-family dwelling units, up to three stories, and their accessory structures. All other residential occupancies, including hotels, motels, lodging houses, apartment houses, condominiums, accessory structures, and many mixed occupancy applications fall outside the scope of the IRC.

The current 2001 CBC, and the 2003 IBC, provides conventional construction methods for wood-framed structures under three-stories. For structures above three-stories either choice of the IBC or the NFPA 5000 will require the user to have the design engineered. So, for structures four-stories and higher, the availability of conventional construction method is relatively unimportant. However, for wood-framed one- to three-story occupancies (other than one- and two-family structures) the availability of conventional construction methods may provide a benefit.

We have tried to quantify how large a universe of structures would fall between the occupancies covered by the IRC and the three-story threshold beyond which all structural components must be engineered. In addition, the Department tried to determine how often the designers of multifamily structures use conventional construction methods. Within the timeframes available, it is difficult to answer either question with precision.

As to the first question regarding the extent of the universe for which conventional standards might be of benefit, the Department was not been able to locate detailed California statistics. National data suggests this number is significant.

According to estimates derived from the 2000 census, the National Multi Housing Council estimates that of apartment units built nationwide between the years 1990 and 2001, 1.7 million out of a total of 1.9 million (89%), were three-stories or less.[7] Although California's statistics might vary to some degree, it is likely that a very substantial portion of apartments would fit this profile.

[7] Characteristics of Rental Apartment Units, 2001; National Multi Housing Council.

In terms of California construction activity, between the years 1998 and 2002, between 31,409 and 43,896 multi-family dwelling units were constructed each year with the low coming in 1998 and the high in 2002. Consistent with this growth trend, more than 50,000 units per year are forecast for 2003 and 2004.[8] Extrapolating from the national data, it is likely that somewhere between 80% and 90% of these multi-family dwelling units will be three-stories or less. As a general rule, the Department believes that most residential structures of this height are wood-framed. Therefore, the portion of its regulated public involved in the construction of these types of residential structures benefit from the availability of the conventional construction methods currently found in the CBC.

The Department has tried to evaluate how extensively the designers and builders of multifamily housing projects use these conventional construction methods. Unfortunately, because the information received thus far has been inconsistent the Department is unable to offer an opinion at this time as to how widespread this practice has been or would be in the future. In the coming weeks the Department intends to continue exploring this question.

To the extent that the conventional construction methods have been used for multifamily housing, that portion of the Department's regulated public could continue to benefit from the conventional methods found in the IBC. Stated conversely, this portion of the public would be denied the currently available standards if the IRC/NFPA 5000 proposal were adopted.

There are three possible alternatives to continue the current availability of conventional construction methods:

a) Incorporate the applicable provisions of the IBC into the NFPA 5000. To the extent this practice serves to reduce professional design expenses associated with multifamily housing it enhances affordability. This alternative, therefore, would preserve the current practices and serve an important public policy.

b) Independently create conventional prescriptive construction methods and standards. The concept of prescriptive standards evolves through tried-and-true construction techniques. This option would create a burden never before, to the Department's knowledge, attempted by a state agency and loses the value of the elaborate national consensus process employed by both code purveyors that ensures input from a wide variety of parties. It would require not merely the creation of the standards, but the design and execution of a process to ensure

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[8] Construction Industry Research Board, Summary of Building Trends and Forecasts, State of California, 1980 – 2004, Table 1-A.

that the standards created are appropriate. It is not impossible, but it would involve a decision-making path of considerable consequence.

c) Require the engineering of all components. This option most closely comports with using the NFPA for all facets of residential construction outside the scope of the IRC but risks losing a proven method of design and the resulting increased cost to affordability.

Summary

The exclusive use of the NFPA for residential occupancies falling outside the scope of the IRC would lose the existing value associated with prescriptive conventional construction methods. Statistically, structures for which conventional construction methods could be applicable appear to be a significant portion of the Department's regulated public. The loss of these standards would result in inefficiencies and the resulting costs would adversely affect housing affordability. The Department does not believe there is a viable mechanism to mitigate the loss of conventional construction methods.

VI. Application of the Department's Priorities.

The Department's priorities remain the same as those stated in the June 11, 2003 report to the CBSC's Code Change Committee and have been restated here for clarity purposes. The following are the Department's conclusions:

Safety

As noted in our initial report to the Commission on June 11, 2003, the first and highest priority is to select a model code that ensures the health and safety of California's residents.

The Department has concluded that for one- and two-family occupancies it is possible to develop and adopt appropriate California amendments to allow the combination the NFPA 5000 and the IRC. With these amendments these occupancies would be built in a manner that would adequately meet the essential requirements for the protection of the public health, safety and general welfare.

For other occupancies, the NFPA 5000 would be independently used. The Department believes that the housing produced would meet expectations in terms of health and safety of the residents. However, the use of the NFPA 5000 remains an untested alternative and because of the differences in formatting and style there is a greater chance of error in enforcement resulting in the possibility of the public being at greater risk. In addition, both the IRC and the NFPA 5000 have been developed individually through an elaborate national consensus

process. The combined use of the different codes has not been subject to a similar process.

Ease of Use (The Impact on the Regulated Public)

In weighing the choice of a combination model code, the Department remains acutely interested in the potential impacts of the code on its regulated public i.e. California's homeowners, contractors, building officials, plans examiners and inspectors, architects and engineers. In its prior report, the Department determined two significant factors in influencing this criterion:

1) Prescriptive versus Reference Standards

The Legislature has delegated the enforcement of building codes for all residential occupancies and their accessory structures to the local building and fire departments.[9] The selected code or combination of codes must be a good fit for what they do. The availability and use of conventional construction standards, where appropriate, is easier to use and, therefore, the more logical choice. While the IRC provides these standards for one- and two-family dwellings the IRC/NFPA 5000 proposal would leave a large number of occupancies without conventional construction provisions. For this reason, the Department does not believe the NFPA 5000/IRC is the best choice for California.

2) Continuity of Organization, Style and Formatting

For those occupancies outside the scope of the IRC, the NFPA's use of reference and scientifically-based calculations may be overly complicated for that portion of the regulated public that is involved in conventional construction. If the CBC becomes too hard to use, there is less likelihood of compliance. Similarly, to the extent that complexity becomes confusion the likelihood of inconsistent code compliance increases. Ultimately, such a consequence could lead to less safety for the residents and greater potential liability for builders, developers, and contractors already impacted by the high cost of construction insurance.

Cost

The Department also has evaluated the potential impact the model codes would have on the cost of housing.

(1) Cost in terms of Affordability

The NFPA 5000/IRC combination would appear to mitigate cost increase concerns for one-and two-family dwellings that use the conventional construction provisions of the IRC. However, it appears that the NFPA

[9] State Housing Law, Health and Safety Code, Sections 17960 and 17962, and 13146 for fire and panic safety.

5000 would increase initial costs of housing construction of single-family homes with engineered component design features. The impact on apartments, condominiums, hotels and motels is uncertain as of this date since the Department has been unable to resolve the question of how often the standards are used in these occupancies. To the extent they are used, the use of scientifically based requirements rather than conventional construction methods necessarily mandate the use of more complicated engineered calculations. This is an additional expense that will impact housing affordability without a discernable benefit. In this regard, the IBC/IRC provides a cost advantage over the IRC/NFPA 5000.

(2) Cost in Terms of Time and Material

In terms of cost related to time and materials, the Department concludes that the prescriptive standards contained within the IRC provide a significant benefit for the regulated public as well as the code enforcement partners at the local level. There appears little question that for the average user the current system of prescriptive standards fills a need.

For all occupancies that fall outside the scope of the IRC, the IRC/NFPA 5000 combination would introduce a more complicated system requiring access or ownership of more books and reference materials, the ability to perform design calculations, and would take more time to apply. To that extent, it adds cost to housing.

The Field Experience of Like Jurisdictions

The experience of Pasadena, Texas has been described in the process section of this report and is contained in greater detail in Attachment C.

At the risk of stating the obvious, Pasadena, Texas, a city with a population of 140,000 is significantly smaller than the state of California and has relatively little construction of multifamily housing, hotels or motels. Even on this dramatically smaller scale, Pasadena is experiencing difficulties adjusting to the NFPA 5000 and is free of the added difficulties in attempting to achieve consistency over more than 500 jurisdictions. One cannot assume that there will be a smooth transition in a state as multifaceted and diverse as California.

VII. Conclusion

The Department considered a variety of options when it evaluated the NFPA 5000, the IBC and the IRC. Although the Department believes that the proposal of combining the NFPA 5000 with the IRC would satisfactorily address the needs of a significant portion of its regulated public, the disadvantages to the

occupancies falling outside the scope of the IRC exceed the benefits of the compromise proposal.

The Department believes that its recommendation submitted on June 11, 2003 continues to provide the best public health, safety, and general welfare protection, the most efficient and effective ease of use, a significant cost advantage, and an acceptable level of confidence in benefit to the regulated public. The Department also is confident that, with the expertise and necessary amendments by the Office of the State Fire Marshal for fire and panic safety concerns, this recommendation would provide the best level of safety, usability and affordability Californians want, need and expect.